

## § 23.443

- (1) Steady slip conditions;
- (2) Uncoordinated rolls from steep banks; or
- (3) Sudden failure of the critical engine with delayed corrective action.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964, as amended by Amdt. 23-7, 34 FR 13090, Aug. 13, 1969; Amdt. 23-14, 38 FR 31821, Nov. 19, 1973; Amdt. 23-28, 47 FR 13315, Mar. 29, 1982; Amdt. 23-42, 56 FR 353, Jan. 3, 1991; Amdt. 23-48, 61 FR 5145, Feb. 9, 1996]

### § 23.443 Gust loads.

(a) Vertical surfaces must be designed to withstand, in unaccelerated flight at speed  $V_C$ , lateral gusts of the values prescribed for  $V_C$  in § 23.333(c).

(b) In addition, for commuter category airplanes, the airplane is assumed to encounter derived gusts normal to the plane of symmetry while in unaccelerated flight at  $V_B$ ,  $V_C$ ,  $V_D$ , and  $V_F$ . The derived gusts and airplane speeds corresponding to these conditions, as determined by §§ 23.341 and 23.345, must be investigated. The shape of the gust must be as specified in § 23.333(c)(2)(i).

(c) In the absence of a more rational analysis, the gust load must be computed as follows:

$$L_{vt} = \frac{K_{gt} U_{de} V a_{vt} S_{vt}}{498}$$

Where—

$L_{vt}$ =Vertical surface loads (lbs.);

$$k_{gt} = \frac{0.88 \mu_{gt}}{5.3 + \mu_{gt}} = \text{gust alleviation factor};$$

$$\mu_{gt} = \frac{2W}{\rho c_t g a_{vt} S_{vt}} \frac{K^2}{l_{vt}} = \text{lateral mass ratio};$$

$U_{de}$ =Derived gust velocity (f.p.s.);

$\rho$ =Air density (slugs/cu.ft.);

$W$ =the applicable weight of the airplane in the particular load case (lbs.);

$S_{vt}$ =Area of vertical surface (ft.<sup>2</sup>);

$c_t$ =Mean geometric chord of vertical surface (ft.);

$a_{vt}$ =Lift curve slope of vertical surface (per radian);

$K$ =Radius of gyration in yaw (ft.);

$l_{vt}$ =Distance from airplane c.g. to lift center of vertical surface (ft.);

$g$ =Acceleration due to gravity (ft./sec.<sup>2</sup>); and

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$V$ =Equivalent airspeed (knots).

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### § 23.445 Outboard fins or winglets.

(a) If outboard fins or winglets are included on the horizontal surfaces or wings, the horizontal surfaces or wings must be designed for their maximum load in combination with loads induced by the fins or winglets and moments or forces exerted on the horizontal surfaces or wings by the fins or winglets.

(b) If outboard fins or winglets extend above and below the horizontal surface, the critical vertical surface loading (the load per unit area as determined under §§ 23.441 and 23.443) must be applied to—

(1) The part of the vertical surfaces above the horizontal surface with 80 percent of that loading applied to the part below the horizontal surface; and

(2) The part of the vertical surfaces below the horizontal surface with 80 percent of that loading applied to the part above the horizontal surface.

(c) The end plate effects of outboard fins or winglets must be taken into account in applying the yawing conditions of §§ 23.441 and 23.443 to the vertical surfaces in paragraph (b) of this section.

(d) When rational methods are used for computing loads, the maneuvering loads of § 23.441 on the vertical surfaces and the one-g horizontal surface load, including induced loads on the horizontal surface and moments or forces exerted on the horizontal surfaces by the vertical surfaces, must be applied simultaneously for the structural loading condition.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964, as amended by Amdt. 23-14, 38 FR 31821, Nov. 19, 1973; Amdt. 23-42, 56 FR 353, Jan. 3, 1991]

## AILERONS AND SPECIAL DEVICES

### § 23.455 Ailerons.

(a) The ailerons must be designed for the loads to which they are subjected—

(1) In the neutral position during symmetrical flight conditions; and